introducing into the plant an expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a polypeptide at least 70% identical to SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to an element in the expression cassette and wherein the polypeptide comprises the sequence MPIANVI; and

detecting a plant with modulated embryo development.

REMARKS

1. Status of the claims

Claims 11, 21, 47, 54 and 55 are amended and claims 74-77 are added. Claims 4-8, 10-20, 23-27, 30-34, 37-38, 40-41, 44-45, 50-53, 56-57, 59-62 and 64-68 were withdrawn from consideration by the Examiner. Thus, claims 1-3, 9, 21-22, 28-29, 35-36, 39, 42-43, 47-49, 54-55, 58, 63, 69, and 70-77 are pending and under consideration with entry of this Amendment.

A marked up copy of amended claims 11, 21, 47, 54 and 55 are provided as Appendix A entitled "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**." As a convenience to the Examiner, a complete set of the claims, as amended herein, is also attached to this Amendment as Appendix B.

2. Support for the Amendments

Support for the amendments to the claims can be found throughout the specification, the drawings, and the claims as originally drafted. For example, support for the sequence "MPIANVI" can be found, e.g., on page 18, line 26 of the present specification and on page 9, line 12 of Application No. 09/103,478, filed June 24, 1998, now U.S. Patent No. 6,235,975. Support for newly added claim 74-77 can be found on, e.g., page 10, lines 20-29 of the present specification. No new matter is added.

3. Rejections under 35 U.S.C. § 112, first paragraph

A. Written Description rejection

Claims 1-3, 9, 35-36, 42-43, 47, 54-55, 58, 63 and 69-73 were rejected as allegedly not meeting the written description. The Examiner argued that two exemplary sequences, whose expression in plants results in embryo modulation, were not sufficient to support the scope of the claims. Applicants respectfully traverse the rejections

The Examiner places too great an emphasis on the number of representative sequences and appears to have overlooked that the specification describes motifs correlated with function. By providing motifs that play a role in function, the specification provides a correlation of structure and function. Moreover, the motifs described in the specification provide guidance to those of skill in the art to identify amino acid residues relevant to function and indicates possible alternatives that maintain function. In *University of California v. Eli Lilly & Co.*, 119 F.3d 1559, 1568 (Fed. Cir. 1997), the Federal Circuit confirmed that every species in a genus need not be described. However, the Federal Circuit required that the specification provide "structural features commonly possessed by members of the genus that distinguish them from others" (Emphasis added). *Id.* The specification provides structural features of LEC1 polypeptides that distinguish the polypeptides from others and provides a basis for their function as required by the Federal Circuit.

The present claims encompass expression cassettes comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a LEC1 polypeptide, comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to any element in the expression cassette, wherein the subsequence comprises the sequence MPIANVI, and wherein the polynucleotide modulates embryo development when the polynucleotide is expressed in a plant. The Examiner appears to criticize the specification because "only" three sequences were provided within the scope of the claims and "only" two sequences were shown to modulate embryo development. *See*, Paper No. 19, pages 4-6. However, the Examiner does not appear to have considered that

by providing structural motifs, the specification provides support for the entire claimed genus, not only two or three sequences. It is unreasonable and scientifically redundant to require Applicants to test every sequence comprising the claimed motifs.

Of particular note, the specification states that LEC1 polypeptides are comprised of an A, B and C domains and that the B domain is homologous to the DNA binding domains of yeast HAP3 proteins. *See, e.g.*, page 17, lines 29 to page 18, line 28 of the specification. Indeed, this homology has been noted in the priority application at least as far back as Application No. 09/103,478, filed June 24, 1998, now U.S. Patent No. 6,235,975. Thus, the structure of a B domain was recognized in the art at the time the application was filed. Indeed, as described in previous Amendments, the applications provide support for polypeptides comprising sequences at least 80% identical to the B domain of the Arabidopsis LEC1 protein. Thus, the specification provides a structural motif that distinguishes the claimed sequences from other sequences and that describes structural aspects for sequences within the scope of the claims.

The specification provides guidance regarding how the B domain can be varied while retaining activity. For instance, Figure 1 of the present application provides an alignment of B domains of LEC1 and HAP3 homologs. This figure acts as a guide to those of skill in the art to determine how the LEC1 B domain can be altered while maintaining activity. Those of skill in the art would have appreciated that it is likely that an amino acid from the Arabidopsis LEC1 B domain could be replaced with the corresponding amino acid from one of the HAP3 sequences depicted in the figure without affecting function. The figure also displays particularly conserved areas as boxed sequences, thereby further indicating which sequences are more likely to play a crucial role in function. Thus, in addition to the exemplary LEC1 sequences provided in the application, the application provided significant guidance regarding alternative structures of the B domain.

To further delimit the sequences encompassed by the claims, Applicants have amended the claims to recite that the encoded LEC1 polypeptides comprise the subsequence MPIANVI. Thus, only sequences that comprise a B domain at least 80%

identical to the B domain provided in SEQ ID NO:2 and that comprise the subsequence MPIANVI are encompassed by the claims.

Moreover, Applicants have previously filed a Declaration of Dr. John Harada, Ph.D., which demonstrates that the B domain provides the structural features necessary to modulate embryo development in plants. For the purposes of written description, the declaration is provided as evidence that the statements in the specification that the B domain is an effective are indeed true. Specifically, the Declaration described experiments that showed that an Arabidopsis *lec1* mutant can be complemented with expression of proteins comprising A and C domains unrelated to the Arabidopsis *LEC1* A and C domains. Expression of the proteins complemented the mutations because the proteins comprised a B domain related to the LEC1 protein. *See, e.g.*, paragraphs 8-9 of the Declaration of John Harada, Ph.D. Indeed, one of the proteins tested (K28D At4g14540) contained even less identity to the B domain than presently claimed. These results show that it is the B domain that controls function. IN addition, the declaration confirms that the sequences flanking the B domain can be greatly varied, indicating that the structure of those sequences are not nearly as relevant to function as the B domain.

In sum, the specification provides significant guidance as to which sequences (e.g., B domain containing sequences) are important for function. Multiple exemplary LEC1 sequences within the scope of the claims are provided in the specification. In addition, Figure 1 provides additional guidance as to how the B domain sequences can be varied while maintaining the B domain structure, and thus function. Moreover, by declaration, Applicants have provided further evidence that the specification was indeed accurate to indicate that the B domain controls function. Accordingly, Applicants submit that the claims fulfill the written description and enablement requirements for the full scope of the claims.

B. Enablement rejection

Claims 1-3, 9, 35-36, 42-43, 47, 54-55, 58, 63 and 69-73 were rejected as allegedly not enabled by the specification. The Examiner argued that two exemplary sequences, whose expression in plants results in embryo modulation, were not sufficient to support the scope of the claims. In addition, the examiner apparently argued that because the claims are not directed to methods of constructing and testing polynucleotides, but are directed to polynucleotide compositions, the guidance in the application is not sufficient. *See*, Office Action, page 8. Applicants respectfully traverse the rejections

Applicants respectfully traverse. To establish a *prima facie* case of non-enablement, the Examiner must show that undue experimentation would be required to make and use the claimed invention. Even if the practice of the claimed invention requires a considerable amount of experimentation, it is not necessarily "undue" experimentation:

> The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed.

In re Wands, 8 USPQ2d 1400 (Fed. Cir. 1988) (citing *In re Angstadt*, 190 USPQ 214 (CCPA 1976). MPEP § 2164.06. Thus, a valid consideration is whether those of skill in the art, in light of the specification and the knowledge in the art, could construct and test candidate polynucleotides. In other words, a specification need not recite numerous possible sequences if those sequences can be readily envisaged, constructed and tested i.e., per *Wands*, if merely routine experimentation is required. Thus, in contrast to the Examiner's statements, the ability to construct and test polynucleotides is relevant to claims directed to the polynucleotide compositions themselves.

As outlined in detail above in the response to the written description rejection, the specification provides significant guidance as to amino acids motifs (e.g., the B domain) that mediate the functions of the claimed LEC1 sequences. For example,

the specification provides guidance regarding how the B domain of LEC1 proteins can be varied while retaining activity. For instance, Figure 1 of the present application provides an alignment of B domains of LEC1 and HAP3 homologs. This figure acts as a guide to those of skill in the art to determine how the LEC1 B domain can be altered while maintaining activity. Those of skill in the art would have appreciated that it is likely that an amino acid from the Arabidopsis LEC1 B domain could be replaced with the corresponding amino acid from one of the HAP3 sequences depicted in the figure without affecting function. The figure also displays particularly conserved areas as boxed sequences, thereby further indicating which sequences are more likely to play a crucial role in function. Thus, in addition to the exemplary LEC1 sequences provided in the specification, the application also provided significant guidance regarding the structure of the B domain, including alternative possible B domain variations depicted in Figure 1.

Moreover, the declaration provides strong evidence that sequence flanking the B domain can be varied greatly while retaining activity. Specifically, the Declaration described experiments that showed that an Arabidopsis *lec1* mutant can be complemented with expression of proteins comprising A and C domains unrelated to the Arabidopsis *LEC1* A and C domains. Expression of the proteins complemented the mutations because the proteins comprised a B domain related to the LEC1 protein. *See, e.g.*, paragraphs 8-9 of the Declaration of John Harada, Ph.D. Indeed, one of the proteins tested (K28D At4g14540) contained even less identity to the B domain than presently claimed.

These results show that it is the B domain that controls function. Therefore, claims directed to sequences comprising subsequences with sequence identity to the B domain provide structural features required for function. As discussed above, the specification provides guidance in the selection of B domain sequences and further refers to previous work involving B domains that have been characterized in yeast proteins. Accordingly, those of skill in the art could have readily selected additional sequences within the scope of the claims, if desired, which when introduced into a plant modulate embryo development. Applicants therefore respectfully request withdrawal of the rejection.

4. Rejections under 35 U.S.C. § 112, second paragraph

Claims 47, 54 and 55 were rejected as allegedly unclear because the claims recite "modulating transcription," which lacks antecedent basis. With entry of this Amendment, antecedent basis is corrected. Accordingly, withdrawal of the rejection is respectfully requested.

5. Rejections under 35 U.S.C. § 102

Claims 21, 22, 28 and 29 were rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Genbank accessions submitted by Lotan *et al.* and Feng *et al.* that became publicly available on July 2, 1998 and October 7, 1998, respectively. In addition, claims 1-3, 9, 21-22, 28-29, 35-36, 39, 42-43, 47-49, 54-55, 58, 63,69 and 70-73 were rejected as allegedly anticipated by a *Cell* paper by Lotan *et al.*, published June 26, 1998. Applicants respectfully traverse the rejections.

The Examiner argued that the priority application 09/103,478 does not disclose "polynucleotides encoding LEC1 polypeptides comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2 that will modulate embryo development when expressed in a plant" and therefore the claimed invention is not entitled to priority. *See*, Office Action, Paper No. 19, page 10. Applicants respectfully note that USSN 09/103,478 describes the presence of the B domain in the LEC1 sequence and states that LEC1 polypeptides share a high homology with the B domains of the yeast HAP3 protein. *See, e.g.*, page 37, lines 1-13 of USSN 09/103,478. Eighty percent sequence identity finds support on, e.g., page 14, line 28 of USSN 09/103,478. Moreover, the '478 application describes a variety of percent homologies between the Arabidopsis LEC1 amino acid sequence and other yeast HAP3 proteins. *See, e.g.*, page 19, lines 1-8 of the '478 application. There should be no question that the '478 application describes the B domain, describes sequences with 80% identity and teaches that expression of the proteins leads to modulation of embryo development (*see*, page 12, lines 26-29 of the '478 application). Since the claims at issue have priority to a filing date before any of the

cited references were publicly available, the references cannot anticipate the present claims. Accordingly, Applicants respectfully request withdrawal of the rejections.

To the extent the Examiner believes new claims 74-77 are anticipated, Applicants note support for newly added claims 74-77 can be found, e.g., from page 4, line 30 to page 5, line 9 of Application No. 09/103,478, filed June 24, 1998, now U.S. Patent No. 6,235,975. Thus, new claims 74-77 have priority to at least as early as June 24, 1998 and therefore are not anticipated by the cited art.

6. Double Patenting Rejection

Claims 1-3, 9, 21-22, 28-29, 35-36, 39, 42-43, 47-49, 54-55, 58, 63 and 69 were rejected for alleged obviousness-type double patenting. Applicants will gladly consider providing the Examiner with a terminal disclaimer after the Examiner has indicated that claimed subject matter is otherwise allowable.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,

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APPENDIX A

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Twice Amended) An expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a LEC1 polypeptide, comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to any element in the expression cassette, wherein the subsequence comprises the sequence MPIANVI, and wherein the polynucleotide modulates embryo development when the polynucleotide is expressed in a plant.

21. (Amended) An isolated nucleic acid or complement thereof, encoding a LEC1 polypeptide comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the subsequence comprises the sequence MPIANVI, with the proviso that the nucleic acid is not clone MNJ7 (Genbank Accession No. AB025628), wherein the LEC1 polypeptide modulates embryo development when expressed in a plant.

47. (Amended) A method of modulating embryo development in a plant, the method comprising,

introducing into the plant an expression cassette containing a plant promoter operably linked to a heterologous LEC1 polynucleotide, the heterologous LEC1 polynucleotide encoding a LEC1 polypeptide comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the subsequence comprises the sequence MPIANVI; and

detecting a plant with modulated embryo development.

54. (Twice Amended) The method of claim 47, wherein [modulating transcription results in] the detecting step comprises detecting the induction of embryonic characteristics in a plant.

55. (Twice Amended) The method of claim 47, wherein [modulating transcription results in] the detecting step comprises detecting the induction of seed development.

APPENDIX B

CLAIMS PENDING AND UNDER CONSIDERATION UPON ENTRY OF AMENDMENT

1. (Twice Amended) An expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a LEC1 polypeptide, comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to any element in the expression cassette, wherein the subsequence comprises the sequence MPIANVI, and wherein the polynucleotide modulates embryo development when the polynucleotide is expressed in a plant.

2. The expression cassette of claim 1, wherein the B domain comprises a polypeptide sequence between about amino acid residue 28 and about residue 117 of SEQ ID NO:2.

3. The expression cassette of claim 1, wherein the B domain comprises a polypeptide sequence with an amino terminus at amino acid residues 28-35 and a carboxy terminus at amino acid residues 103-117 of SEQ ID NO:2.

9. The expression cassette of claim 1, wherein the promoter is a constitutive promoter.

21. (Amended) An isolated nucleic acid or complement thereof, encoding a LEC1 polypeptide comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the subsequence comprises the sequence MPIANVI, with the proviso that the nucleic acid is not clone MNJ7 (Genbank Accession No. AB025628), wherein the LEC1 polypeptide modulates embryo development when expressed in a plant.

22. The isolated nucleic acid of claim 21, wherein the B domain comprises a polypeptide sequence with an amino terminus at amino acids 28-35 and a carboxy terminus at amino acids 103-117 of SEQ ID NO:2.

28. The isolated nucleic acid of claim 21, wherein the nucleic acid further comprises a promoter operably linked to the LEC1-encoding nucleic acid.

29. The isolated nucleic acid of claim 29, wherein the promoter is a constitutive promoter.

35. (Amended) A host cell comprising an expression cassette according to any of claim 1 or a nucleic acid molecule according to claim 21, wherein the expression cassette or nucleic acid molecule is flanked by a heterologous sequence.

36. The host cell of claim 35, comprising an expression cassette of claim 1.

39. The host cell of claim 35, comprising a nucleic acid molecule of claim 21.

42. (Amended) A method of introducing an isolated nucleic acid into a host cell comprising:

(a) providing an expression cassette according to any of claim 1 or an isolated nucleic acid according to claim 21; and

(b) contacting the expression cassette or nucleic acid with the host cell under conditions that permit insertion of the nucleic acid into the host cell.

43. The method of claim 42, providing the expression cassette of claim 1.

46. The method of claim 42, providing the nucleic acid of claim 21.

47. (Amended) A method of modulating embryo development in a plant, the method comprising,

introducing into the plant an expression cassette containing a plant promoter operably linked to a heterologous LEC1 polynucleotide, the heterologous LEC1 polynucleotide encoding a LEC1 polypeptide comprising a subsequence at least 80% identical to the B domain of SEQ ID NO:2, wherein the subsequence comprises the sequence MPIANVI; and

detecting a plant with modulated embryo development.

48. The method of claim 47, wherein the LEC1 polynucleotide encodes SEQ ID NO:2.

49. The method of claim 48, wherein the LEC1 polynucleotide is SEQ ID NO:1.

54. (Twice Amended) The method of claim 47, wherein the detecting step comprises detecting the induction of embryonic characteristics in a plant.

55. (Twice Amended) The method of claim 47, wherein the detecting step comprises detecting the induction of seed development.

58. A transgenic plant cell or transgenic plant comprising the recombinant expression cassette of claim 1.

63. The transgenic plant cell or transgenic plant of claim 58, wherein the promoter is a constitutive promoter.

69. A plant which has been regenerated from a plant cell according to 58.

70. The expression cassette of claim 1, wherein the B domain comprises a polypeptide sequence between amino acid residue 28 and residue 117 of SEQ ID NO:2.

71. The isolated nucleic acid of claim 21, wherein the B domain comprises a polypeptide sequence between amino acid residue 28 and residue 117 of SEQ ID NO:2.

72. The host cell of claim 35, wherein the B domain comprises a polypeptide sequence between amino acid residue 28 and residue 117 of SEQ ID NO:2.

73. The method of claim 47, wherein the B domain comprises a polypeptide sequence between amino acid residue 28 and residue 117 of SEQ ID NO:2.

74. (New) An expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a polypeptide at least 70% identical to SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to an element in the expression cassette, wherein the polypeptide comprises the sequence MPIANVI, and wherein the polynucleotide modulates embryo development when the polynucleotide is expressed in a plant.

75 (New) A transgenic plant cell or transgenic plant comprising an expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a polypeptide at least 70% identical to SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to an

element in the expression cassette and wherein the polypeptide comprises the sequence MPIANVI.

76. (New) A host cell comprising an expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a polypeptide at least 70% identical to SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to an element in the expression cassette and wherein the polypeptide comprises the sequence MPIANVI.

77. (New) A method of modulating embryo development in a plant, the method comprising,

introducing into the plant an expression cassette comprising a promoter operably linked to a heterologous polynucleotide sequence, or a complement thereof, encoding a polypeptide at least 70% identical to SEQ ID NO:2, wherein the polynucleotide sequence is heterologous to an element in the expression cassette and wherein the polypeptide comprises the sequence MPIANVI; and

detecting a plant with modulated embryo development.